

REMARKS

Claims 1, 2, 5-7 and 9-28 remain active in the case. Reconsideration is respectfully requested.

The present invention relates to a battery that is light in weight and has a high discharge current at a high current density.

Claim Amendments

Claims 5 and 6 have been amended so as to provide proper underlining of a definite article in each of the claims. Entry of the amendments into the record is respectfully requested.

Claim Rejection, 35 USC 112

Applicants contend that the phrase indicated by the Examiner as indefinite, in fact, is not indefinite, because the identification of the ions that pass through the porous adhesive layer is completely dependent upon the materials selected for the anode and cathode of a given battery. Page 14 of the text provides specific examples of battery types that can be prepared using the porous adhesive layer of the present invention, and these batteries include the likes of primary lithium batteries, manganese-zinc batteries and silver-zinc batteries, so that the ions that flow through the adhesive layer in these batteries are specific to the oxidation and reduction reactions that occur in each battery. In Example 1, for instance, trivalent cobalt of  $\text{LiCoO}_2$  of the positive electrode is reduced forming a reduced cobalt species while carbon cations are formed at the negative electrode. Thus, the ions which flow through the adhesive layer of the battery of Example 1 are of a specific type as would be readily recognized by one of skill in the art. Accordingly, the claims are not indefinite with respect to the language of Claim 1 that has been

objected to and withdrawal of the rejection is respectfully requested.

#### Invention

The objective achieved in the present invention is a light weight and thin battery that exhibits improved battery characteristics with improved internal adhesive strength. As claimed, the battery comprises a battery body comprising a positive electrode and a negative electrode each containing an active material, a separator holding an electrolyte, and an adhesive resin layer joining at least one of the positive and the negative electrodes to the separator, wherein the adhesive resin layer comprises at least one layer and particles of a filler, the filler in the adhesive resin layer providing passages through the resin layer (through holes) through which ions pass.

#### Prior Art Rejection

Claims 1, 2, 5, 7 and 9-11 stand rejected based on 35 USC 102(b) as anticipated by WO 97/08763 (Yamashita et al, U. S. Patent 6,287,720). This ground of rejection is respectfully traversed.

Although it is clear that Yamashita et al disclose a battery that is comprised of a positive electrode and a negative electrode with a separator disposed between the two electrodes, wherein the separator is described as a porous layer made so by the presence of aggregate particles within the porous layer, nevertheless, contrary to the Examiner's statement of paragraph 7; page 5, lines 6-8 of the Office Action, there is no basis whatever to assume that the separator layer is an adhesive resin layer, thereby anticipating the present invention as claimed. In fact, if the separator of the reference is an adhesive layer, then it no longer is a separator layer which is a layer that is required both by the reference and in the claimed battery of the present invention.

The simple fact is that the reference only teaches the separation of positive and negative battery electrodes with a porous separator layer positioned therebetween with no disclosure anywhere of any type of adhesive layer that bonds a separator to an electrode. There is no disclosure or suggestion of at least one porous, filler containing adhesive layer that bonds at least a separator layer to one of the electrodes of a battery. Accordingly, the rejection of the claims in view of Yamashita et al fails and withdrawal of the rejection is respectfully requested.

Claims 1, 2, 5, 7 and 9-12 stand rejected based on 35 USC 102(e) as anticipated by Chen et al '609. This ground of rejection is respectfully traversed.

The Chen et al patent discloses an electrochemical cell of which a battery is a type. Adhesive material layers 20 and 30 are shown and are said to contain electrolyte active species. Suitable such electrolyte compounds are disclosed at column 4, lines 11-33 of the patent. However, most importantly, these compounds are dissolvable electrolyte compounds and are not chemically inert filler particles. In fact, the reference fails to disclose the presence of a filler, although the patent teaches that the adhesive material may be porous (column 3, lines 37-39). However, because the material is not provided with a filler, the extent or degree of porosity of the material is small. Moreover, even though porosity is mentioned in the patent, there is no disclosure in the reference as to the significance of porosity.

Chen et al further teaches that the layer of the adhesive material may include an active electrolyte species, whether the material is polymeric or some other material (col 3, lines 36-37). However, the objective here is the enhancement of the ion conductivity of the adhesive layer by incorporating an electrolyte salt in the adhesive layer. Clearly, the patent does not teach or suggest that the presence of the electrolyte salt renders the adhesive layer porous or has the function of providing the layer with through holes. Thus, the reference fails to teach or suggest

the adhesive layer component of the present battery which contains a filler component to facilitate the passage of ions between the electrodes via the intermediate electrolyte layer.

Yet another distinction between the present invention as claimed and the Chen et al disclosure is that, as stated at column 4, lines 34-43 of the patent, the adhesive layers function by bonding each of the active electrode material layers to the electrolyte layer, thereby enhancing the performance of the electrolyte layer. No separator layer(s) is (are) disclosed in the reference. Clearly, the Chen et al patent contains no teaching or suggestion of the presently claimed battery in which at least one porous, filler containing adhesive layer is provided in the cell to bond a separator layer to at least one electrode. Accordingly, the anticipatory ground of rejection is believed to fail and withdrawal of the rejection is respectfully requested.

Claims 1, 2, 5-7 and 9-12 stand rejected based on 35 USC 102(e) as anticipated by Hamano et al '061. This ground of rejection is respectfully traversed.

The Hamano et al patent discloses a secondary lithium ion battery which, in part, contains porous adhesive layers 11 that bond the electrolyte layer to the negative and positive electrodes. Although the adhesive layers are indicated as being porous, i. e., the layers contain through holes, the porosity is developed by the evaporation of the solvent NMP (N-methylpyrrolidone) from the adhesive layer material (see column 9, lines 6-15). There is absolutely no teaching or suggestion of an adhesive layer containing filler particles which provide passage spaces within the adhesive layer for the passage of lithium ions therethrough. Because the reference does not teach the use of a filler in the adhesive layer, it is impossible to form many through holes in the layer. That is, the porosity of the layer is low.

The Examiner contends that the phrase "the filler in the adhesive resin layer rendering the layer porous" is a product-by-process limitation and therefore can be given no consideration

Appln. No. 10/057,913

Reply to the Office Action of June 3, 2004

as to patentability in a product claim. However, the noted limitation is **not** a product-by-process limitation. Rather, the limitation states a structural feature of the adhesive layer which is that the filler particles in the adhesive layer create through holes in the layer. There is **no processing** here. Rather, because filler particles are present in the adhesive layer, this means that the adhesive layer **inherently and necessarily** is porous and has passages therethrough. This is a **structural** feature. This is not process language. Accordingly, the distinction between the disclosure of the patent and the present invention is clear, and accordingly, the anticipatory ground of rejection is believed overcome and withdrawal of the rejection is respectfully requested.

Claim 13 stands rejected based on 35 USC 103(a) as obvious over Hamano et al '061 in view of Dasgupta et al '489. This ground of rejection is respectfully traversed.

While it is clear that it is known in battery construction that a form of construction has positive and negative electrodes alternately disposed between folded separators, the fact is that the battery construction of present Claim 13 is ultimately dependent on Claim 1 which specifies that the adhesive layer employed contains filler particles which in turn means that the layer is porous and has through holes therethrough. This feature is not found in the adhesive resin layer of Hamano et al. Accordingly, by virtue of its dependency on Claim 1, Claim 13 is distinct over Hamano et al.

The deficiencies of Hamano et al are neither overcome or improved upon by Dasgupta et al '489. The '489 patent discloses adhesive coating layer 9 of the disclosed battery which is said to contain a lithium ion containing compound. The most likely compound is  $\text{LiPF}_6$ . Accordingly, the adhesive layer that is disclosed does **not** contain a filler, but rather contains a dissolvable electrolyte. The adhesive layer of the patent does not contain filler particles which

provide physical passage of lithium ions through the layer, thereby facilitating the movement of lithium ions within the battery. In fact, there is no teaching in the patent that the lithium ions render the adhesive layer porous thereby providing through holes in the layer. Accordingly, the combined reference disclosures do not suggest the invention as claimed and withdrawal of the obviousness ground of rejection is requested.

Claim 13 stands rejected based on 35 USC 103(a) as obvious over Chen et al '609 in view of Dasgupta et al '489. This ground of rejection is respectfully traversed.

As noted above, Chen et al discloses an electrochemical cell that is comprised of adhesive material layers 20 and 30 that are said to contain electrolyte active species. However, these compounds are dissolvable electrolyte compounds and are not chemically inert filler particles as required for use in the adhesive layer of the cell of the invention. This difference is of great significance because the subject matter of Claim 13 depends on Claim 1 which is distinguished over Chen et al.

The deficiencies of Chen et al are neither overcome or improved upon by Dasgupta et al '489. As noted immediately above, the '489 patent discloses adhesive coating layer 9 of the disclosed battery which is said to contain a lithium ion containing compound that is likely  $\text{LiPF}_6$ . Accordingly, the adhesive layer that is disclosed does not contain a filler, but rather contains a dissolvable electrolyte. The adhesive layer of the patent does not contain filler particles which provide physical passage of lithium ions through the layer, thereby facilitating the movement of lithium ions within the battery. In fact, there is no teaching in the patent that the lithium ions render the adhesive layer porous thereby providing through holes in the layer. Accordingly, the combined reference disclosures do not suggest the invention as claimed and withdrawal of the obviousness ground of rejection is requested.

Claim 13 stands rejected based on 35 USC 103(a) as obvious over WO 97/08763 in view of Dasgupta et al '489. This ground of rejection is respectfully traversed.

As has been observed above in the discussion of WO '763 ('720), Yamashita et al does not disclose a battery that contains an adhesive layer as a component. Rather, the reference only discloses a battery in which a separator layer is positioned in contact with each of a positive electrode and a negative electrode.

Although the Dasgupta et al '489 patent discloses a battery with adhesive coating layer 9 that is said to contain a lithium ion containing compound, the patent is totally silent as to an adhesive layer that contains a filler, the presence of which provides the adhesive layer with holes or ion passageways therethrough. Rather, the reference teaches a dissolvable electrolyte. The adhesive layer of the patent does not contain filler particles which provide physical passage of lithium ions through the layer, thereby facilitating the movement of lithium ions within the battery. Accordingly, the combined reference disclosures do not suggest the invention as claimed and withdrawal of the obviousness ground of rejection is requested.

Appln. No. 10/057,913  
Reply to the Office Action of June 3, 2004

It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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